

What is Claimed is:

1. An ATM communication apparatus comprising:

a traffic supervisory unit for supervising traffic situation of  
 5 upstream ATM cells sent from a plurality of the optical network units, the  
 traffic supervisory unit having a supervisory unit of a receiving bandwidth  
 for detecting the receiving bandwidth of ATM cells transmitted by optical  
 network units and a supervisory unit of cell overflow situation for detecting  
 a sending buffer in said optical network units;

10 a bandwidth controller having a basic bandwidth assigner for  
 assigning the basic bandwidth, a shared bandwidth assigner for assigning  
 a shared bandwidth based on an upper-limit bandwidth and a receiving  
 bandwidth and cell overflow situation that were supplied from said traffic  
 supervisory unit and the shared bandwidth memory for maintaining the  
 15 assigned shared bandwidth; and

a generator of <sup>permission</sup> ~~an upstream~~ cell for  
 generating permission to transmit an upstream cell <sup>from</sup> to the optical network  
 units according to the shared bandwidth assigned by the bandwidth  
 controller.

20 2. The ATM communication apparatus according to claim 1, wherein said  
 shared bandwidth assigner of said bandwidth controller comprises:

a bandwidth fair distributor for assigning the shared bandwidth  
 based on the receiving bandwidth and the cell overflow situation sent by  
 25 said traffic supervisory unit; and

an upper-limit bandwidth limiter for limiting the upper-limit  
 bandwidth based on the upper-limit bandwidth.

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3. The ATM communication apparatus according to claim 1, wherein said shared bandwidth memory comprises a plurality of divided sub-shared bandwidth memories and said shared bandwidth assigner further comprises a shared bandwidth selector for selecting any one out of a plurality of said sub-shared bandwidth memories for each of subscriber terminals respectively.

4. The ATM communication apparatus according to claim 1, wherein said supervisory unit of cell overflow situation comprises a bandwidth comparator that compares the receiving bandwidth of effective cells received from each of the optical network units and judges that the cell is in the overflow situation in the case where an access bandwidth judged by said bandwidth controller and a receiving cell bandwidth of each of the optical network units are the same or approximate.

5. The ATM communication apparatus according to claim 1, wherein said supervisory unit of cell overflow situation comprises an invalid cell detector that detects invalid cells received from each of the optical network units and judges that the cell is in the overflow situation in the case where the invalid cell was not detected.

6. The bandwidth control apparatus according to claim 1, wherein said bandwidth controller assigns a plurality of the separate assignment bandwidths for one optical network unit to a plurality of the shared bandwidths respectively.

7. The bandwidth control apparatus according to claim 1, wherein said

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bandwidth controller assigns the shared bandwidth based on a predetermined priority for each of the sub-shared bandwidths.

8. The bandwidth control apparatus according to claim 1, wherein said  
5 bandwidth controller provides a plurality of kinds of the basic bandwidths and assigns the shared bandwidth in proportion to each of the basic bandwidths.

9. The bandwidth control apparatus according to claim 1, wherein said  
10 bandwidth controller assigns one of the basic bandwidth and the shared bandwidth based on the contents of a plurality of subscriber contracts set for one optical network unit.

10. A bandwidth control method that issues permission to transmit an  
15 upstream cell to a plurality of optical network units, comprising:

supervising traffic situation of an upstream ATM cells sent from a plurality of the optical network units;

detecting receiving bandwidth status and overflow situation of the ATM cells, which were transmitted from a plurality of the optical network  
20 units;

judging an access bandwidth of each of the optical network units according to the receiving bandwidth status and the cell overflow situation, which were detected, and a basic bandwidth and an upper-limited bandwidth;

25 guaranteeing the basic bandwidth determined for each of the optical network units;

distributing the shared bandwidth in the range of the upper-limit

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bandwidth where bandwidth distribution is judged to be necessary for the optical network units that are in the overflow situation or for the optical network units to which a shared bandwidth is set beyond the basic bandwidth based on the detected receiving bandwidth and the cell overflow situation.

11. The bandwidth control method according to claim 10, wherein the shared bandwidth to be distributed is further divided into sub-shared bandwidths in distributing said shared bandwidth such that selection is made as to from which sub-shared bandwidth the distribution is performed on every optical network unit out of a plurality of the divided sub-shared bandwidths.

12. The bandwidth control method according to claim 10, wherein the shared bandwidth is assigned based on the receiving bandwidth and the cell overflow situation, which were supervised, to limit the upper-limit bandwidth based on the upper-limit bandwidth.

13. The bandwidth control method according to claim 10, wherein the receiving bandwidths of the effective cells, which were received from each of the optical network units, are compared to judge that the cell is in the overflow situation in the case where the judged access bandwidth and the receiving cell bandwidth of each of the optical network units are the same or approximate.

14. The bandwidth control method according to claim 10, wherein the invalid cells, which were received from each of the optical network units,

are detected to judge that the cell is in the overflow situation in the case where the invalid cell was not detected.

15. The bandwidth control method according to claim 10, wherein a  
5 plurality of the separate assignment bandwidths for one optical network unit are assigned to a plurality of the shared bandwidths respectively.

16. The bandwidth control method according to claim 10, wherein the shared bandwidth is assigned based on a predetermined priority for each of the sub-shared bandwidths respectively.

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17. The bandwidth control method according to claim 10, wherein a plurality of kinds of the basic bandwidths are provided to assign the shared bandwidth in proportion to each of the basic bandwidths respectively.

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18. The bandwidth control method according to claim 10, wherein one of the basic bandwidth and the shared bandwidth is assigned based on the contents of a plurality of subscriber contracts set for one optical network unit.

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